Diffusion-weighted MR Imaging of Deep Vein Thrombosis

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(Received October 24, 2014; Accepted March 25, 2015; published online June 23, 2015)

Magnetic resonance (MR) imaging is not commonly used as a diagnostic tool for deep vein thrombosis (DVT). Technological advances in fat saturation pulse sequences and surface coils have enabled the application of diffusion-weighted imaging (DWI) to whole-body imaging,1 and we applied this technique to detect DVT and evaluated its tissue contrast.

To evaluate the extent of DVT in a 60-year-old woman with asymptomatic pulmonary thromboembolism, we performed noncontrast diffusion and T1-weighted MR imaging (T1WI) of her lower legs after obtaining her informed consent. She underwent MR imaging using a 1.5-tesla superconducting system combined with a 12-channel body-phased array coil (Signa Excite HDxt; GE Medical Systems, WI, USA). DWI was performed in the transverse plane using single-shot echo planar imaging with fat suppression and short-tau inversion recovery (STIR) within 7 min (repetition time [TR]/echo time [TE]/IR, 10000/65.3/200 ms; field of view (FOV), 480 × 480 mm; matrix, 64 × 128; slice thickness, 7 mm with 1.4-mm overlap; 152 slices; band width, ± 125 kHz; number of excitations, 2; phase FOV, 0.5; asset factor, 2; and b values of 1000 mm²/s).

Coronal maximum intensity projection of DWI (Fig. 1A) showed a lesion with branching high signal intensity (SI) in the right lower limb. In addition, T1WI showed a lesion with high SI in the right posterior tibial and soleus veins, which indicated DVT. Axial-merged images showed colocalization of the high SI lesion on DWI and T1WI (Fig. 1B). The high SI of the DVT on DWI was compatible with that of a cerebral vein thrombus2 and over half of the portal vein thrombi.3 These results suggest that the high SI of venous thrombi on DWI is a characteristic finding. However, the sensitivity and specificity of combined DWI/T2-weighted MR imaging were better than those of DWI alone as a screening tool for detecting abdominal malignancies. The merged DWI and T1WI images added anatomical and qualitative information to the high SI lesion on DWI. In addition, a lesion of low SI in MR venography may support the diagnosis of DVT. Tumors, inflammatory lesions, and several normal structures in the lower limb (peripheral nerves, lymphatic system, and bone marrow) exhibit impeded diffusion.1 Therefore, careful evaluation of DWI findings along with other MR imaging sequences and clinical and laboratory findings is necessary to reduce false-positive diagnoses.

References
Fig. 1. Magnetic resonance imaging of deep vein thrombosis. (A) Coronal maximum intensity projection of diffusion-weighted imaging (DWI) shows branching lesions of high intensity (arrows) in the right lower leg. (B) Coregistration axial image corresponding to the white line level in A shows colocalization of a lesion with high signal intensity (arrowheads) on DWI (pseudocolor image) and T1-weighted imaging (T1WI). The axial planes of the T1WIs were derived from reconstructed 3-dimensional T1WI images, and the thicknesses of the axial images were consistent with those of DWI.